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# STUDY PROJECT

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## HISTORICAL AND FUTURE ROLES OF THE TACTICAL SIGNAL OFFICER

BY

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Coordinating the integration of battlefield automated systems and communications systems, supporting command and control functions, has and continues to require a trained advisor, in communications and other information/signal support systems disciplines. The Signal Officer has been the officer providing combatant commanders timely advice and assistance in the use of their command, control and communications systems since the Civil War.

This study gives the history behind the creation of the Signal Corps and the reasoning that led to the addition of Signal Officers to organizational structures of non-signal maneuver units. It also provides arguments for why there is a more pressing need in the near and mid-term for Signal Officers to be an integral part of tactical combatant unit organizations. Finally, this study will address the future role of the Signal Corps officer at the tactical level, and the potential impact of the Signal Officer's role as the Army progresses into the 21st century.

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HISTORICAL AND FUTURE ROLES OF THE TACTICAL SIGNAL OFFICER

A GROUP STUDY PROJECT

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## ABSTRACT

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Signal Officers have played a significant role providing Army commanders support for command and control functions since the Civil War.

Today's combatant force commanders face a more complex, robust and lethal battlefield due to technological advances in all aspects of warfare. One area that has experienced an enormous surge in technological complexity has been tactical command, control and communications.

The battlefield functional areas of maneuver control, fire support, air defense, combat service support, and intelligence and electronic warfare have automated systems in production or near fielding. These systems will provide combatant commanders timely information necessary to win in battle. A more technically capable umbrella of communications systems continues to be fielded to accept the voice and data information load offered by the emerging battlefield automated systems.

Coordinating the integration of battlefield automated systems and communications systems, supporting command and control functions, has and continues to require a trained advisor in communications and other information/signal support systems disciplines. The Signal Officer has been the officer providing combatant commanders timely advice and assistance in the use of their command, control and communications systems since the Civil War.

This study gives the history behind the creation of the Signal Corps and the reasoning that led to the addition of Signal Officers to organizational structures of non-signal maneuver units. It also provides arguments for why there is a more pressing need in the near and mid-term for Signal Officers to be an integral part of tactical combatant unit organizations. Finally, this study will address the future role of the Signal Corps officer at the tactical level, and the potential impact of the Signal Officer's role as the Army progresses into the 21st century.

## INTRODUCTION

The function of signal is performed by a branch of the U.S. Army with the same designation. Signaling has been a viable part of U.S. Army commanders ability to command and control their forces since the Civil War. Signaling is a dynamic function that has experienced dramatic technological changes since the use of flags, torches, messenger, and electric telegraphy as primary means in the Civil War.

Two of the most significant breakthroughs in signaling technology, applied to tactical military command and control, in the twentieth century were telephone and radio. Radio technology applications that affected warfighting the most included single channel, very high frequency, frequency modulated (VHF-FM) portable and mobile radios; radio detection and range (RADAR); multi-channel transmissions of voice and data circuits using VHF-FM and microwave radio; radio transponders in satellites and the upward-looking radio ground terminals associated with satellite communications systems. Significant contributions that telephone technology has made to tactical communications has been in electro-mechanical switching, and digital switching techniques for voice and data circuits.

Computer and digital technologies brought us into the automation age, and are embedded in all facets of the five disciplines now assigned to the Signal Corps for management and staff oversight. These disciplines are communications, automation, visual information, printing and publications, and records

management. Each of these disciplines is applied in some degree in all battlefield functional mission areas.

Applying signal technology to the conduct of battle has served to increase the capability of battlefield commanders to make quicker decisions and win in war. The officer corps of the branch of Signal has played a significant role in determining the application of signal technology to all battlefield functional mission areas throughout the Corps' existence. The Signal Officer's role and stature in non-signal units, mainly maneuver units, have been points of contention since the Civil War.

#### PURPOSE OF THE STUDY

The purpose of this study is to assess the need to maintain Signal Officers in non-signal units. This will be done by a historical review of how and why the Signal Corps was formed; identifying the contributions, roles and growth of the Signal Officer Corps; current roles and missions of Signal Officers; and conclude with a vision and recommendations for the future role of Signal Officers in non-signal organizations.

#### HISTORY

##### Civil War

The Army Staff position of Signal Officer was established in 1860. Major Albert J. Myer became the first Signal Officer in charge of the Army Signal Department. He spearheaded the Union Army's use of signaling to improve command and control.<sup>1</sup> Initially, this was the only position authorized for Signal. Officers and soldiers from the combat arms were detailed and trained to perform the duties of signaling using Myer's patented

"Improved System of Signalizing."<sup>2</sup> From this we can deduce that the function of Signaling was performed by technical and combat arms personnel. This also means that Signal was a technical service and a combat arm.

Combat arms officers and soldiers, detailed for signal duties, did not receive the same consideration as their peers for promotion while performing in signaling positions. There were no opportunities for advancement in signaling because there were no authorizations, except for Major Myer's, in the Army structure for Signal Officers or enlisted soldiers. Commanders were reluctant to let skilled Signal Officers and flagmen revert to their former units of assignments and compete for promotion or leadership positions. This reluctance by commanders stifled the promotions of many fine officers and soldiers during the War. Major Myer resented this treatment of officers and flagmen. His proposed solution to the Secretary of War in 1860, was to form a separate Signal Corps.<sup>3</sup>

The value of signaling on the Civil War battlefield became evident to Union Army leaders with a Confederate victory at Bull Run. After this defeat Union leaders demanded more signalmen, which led Congress to establish the Signal Corps as a branch of the Army in March 1863. Congress laid out its organization in detail. It was to be comprised of one Chief Signal Officer, Colonel in grade; one Lieutenant Colonel, and two Majors. Each Army Corps and every Military Department would be staffed with one Captain, and from one to eight Lieutenants. In addition, for every



commissioned officer an NCO would be detailed, with six Privates first and second class.<sup>4</sup>

During the Coastal Campaign, that began in August 1861, Signal Officers and Flag Signalmen pioneered joint amphibious warfare by controlling the landing of Union troops at Hatteras Inlet and directing naval gunfire.<sup>8</sup>

During the battle of Antietam in September 1862, signalmen reported Lee's troop dispositions redeployments, shifting of artillery and cavalry movements.<sup>5</sup> Signalmen on Elk Mountain during the same battle warned of Stonewall Jackson's cavalry attempting to turn Burnside's flanks.<sup>6</sup> The Confederates attributed part of their failure to win the Battle of Antietam to Union Signalmen, and placed more emphasis on the use of its own Signal Corps.<sup>7</sup>

During the Battle of Fredericksburg in December 1862, Signal Officers and Flagmen served as fire control parties for Union Artillery and accompanied Union Infantry forces in the first wave to cross the Rappahannock river. Signalmen were also credited with support for the orderly night withdrawal of Union forces back across the river after a bloody five day battle.<sup>9</sup>

At the Battle of Gettysburg in July 1863, Signal Officers and Flagmen provided information on Confederate troop movements, directed Union forces into battlefield positions, and coordinated artillery fires. A Union signal party on Little Round Top, led by Captain Hall, delayed the attack of a Confederate Division on 2 July 1863. Their wig-wagging of flags led the Confederate forces

to believe a Union force occupied Little Round Top. This was an event that changed the outcome of the battle.<sup>10</sup>

General Sherman used signaling extensively in his march through the South. With the help of signaling at Vining's Station he monitored the battle of Alltoona in which Confederate forces under General Hood were defeated.<sup>11</sup>

The Civil War period is full of stories of the bravery and efforts of signalmen who exposed themselves to get the message through to commanders. Private Morgan D. Lane, a Signal Soldier, received the Medal of Honor for heroic service in the War.

#### Opening of The West

After the Civil War demobilization, the Army was drastically reduced in size. The Signal Corps was reduced to one lieutenant and two clerks. A Congressional Act in 1866 made the position of Chief Signal Officer of the Army permanent, and authorized it at the grade of colonel. This act also authorized the Secretary of War to detail "for the performance of signal duty" six officers and not more than 100 enlisted soldiers from the Corps of Engineers. A subsequent Congressional Act in 1875 authorized the Signal Corps 450 enlisted personnel and the Chief Signal Officer in the grade of Colonel. This Act also allowed detailing of combat arms branch officers as acting Signal Officers.<sup>12</sup>

During the period 1866-1890 the government emphasized opening the Western territories. The Signal Corps became responsible for building telegraph lines to support opening of the West. Another of its missions was developing a nation-wide weather service that eventually became the U.S. Weather Bureau.

Lieutenant Adolphus W. Greely played a major role in both endeavors, and became famous for leading the two-year Arctic exploration expedition that began in 1881.<sup>13</sup> In December 1880 Brigadier General William Babcock Hazen became the second Chief Signal Officer.

During the Indian Wars of this period, signalmen accompanied the cavalry on its campaigns against the Indians and introduced heliograph as a new signaling technique. Success in many battles with the Indians was dependent on signal soldiers employed at isolated relay sites to pinpoint and report on Indian movements and encampments.<sup>14</sup> Brigadier General Adolphus W. Greely was promoted from Captain to Brigadier General and became the third Chief Signal Officer in January 1887. He was a highly decorated Civil War Brevet Infantry Major, who after the War was appointed a Lieutenant in the regular Infantry. He subsequently transferred to the Cavalry after two years, then was detailed as an acting Signal Officer in 1868.<sup>15</sup>

#### Spanish-American War

At the beginning of the Spanish-American War in 1898 the Signal Corps consisted of 10 officers and 50 enlisted members. By the War's end the Corps had an authorized strength of 46 officers and 1,212 enlisted members. The increase was due to the Congressional Act on 18 May 1898 establishing the United States Volunteer Signal Corps (USVSC) for the duration of the War. The Act provided for one Colonel; one Lieutenant Colonel; one Major to serve as disbursing officer; one Major for every Army Corps; and for every Division two Captains, two First Lieutenants, two Second

Lieutenants, five First-Class Sergeants, ten Sergeants, ten Corporals and thirty Privates. Lieutenant Colonel James Allen of the USVSC helped the U.S. make command and control history during the war. He led the effort to cut two enemy submarine cables that tied the Spanish Army in Cuba to Spain. He rerouted one of the cables to Palquini in preparation for the U.S. Army landing on Cuban soil. LTC James, his signalmen and boat crew on the ship Adria accomplished both feats while under heavy artillery fire from the Spanish on shore. The cable taken ashore provided instant telegraph communications from the U.S. Army Cuban Expeditionary Forces to the War Department in Washington, D.C.. This was the first known tying of a country's military on foreign soil to its seat of government by telegraph.<sup>16</sup>

Captain E. A. McKenna was the commander of the 1st Signal Company supporting General Merritt's Eighth Corps in the Philippine Campaign. His company coordinated the naval bombardment of Manila that supported the Army's ground attack against Spanish forces defending the city. Signalmen from McKenna's unit also established an extensive telegraph network in three days, while working around the clock under enemy fire. Sergeant George S. Gibbs of the 1st Signal Company signaled the capture of Fort Malate to Admiral Dewey's fleet in Manila Bay. Sergeant Gibbs later became Major General Gibbs, and Chief of Signal in 1928.<sup>17</sup>

#### Philippine War Insurrection

The Philippine Insurrection was a guerrilla war of rebellion against the United States that lasted three years beginning in

February 1899. During the War. in 1901, Congress enacted Army force cuts that reduced the Signal Corps strength from 46 officers and 1212 enlisted men to a total of 850 personnel. The Signal Corps consisted of one Brigadier General, one Colonel, one Lieutenant Colonel, fourteen Captains, fourteen First Lieutenants, and 810 enlisted members.<sup>18</sup>

During 1899-1906 the Signal Corps took part in many historic communications events around the world. It ran the fire control systems of the U.S. Army Coast Artillery; it sensed the traffic and directed the operations of commercial telegraph and cable lines that tied Spain to Cuba; it supported the combat forces in Cuba, Puerto Rico, and the Philippines. During the Philippine Insurrection signal corps support was provided to the Second and First Divisions in combat operations in which Lieutenant Charles E. Kilbourne, a Signal Officer, received the Medal of Honor; constructed a telegraph line across Alaska; constructed a submarine cable system along the Western U.S. Coast from Washington State to Alaska; integrated the two West Coast-Alaska systems into a network that went from Alaska to Washington D.C.; and during the Boxer War in China it constructed telegraph lines from the Chinese Coast to Peking in a combined operation with the British Army Royal Engineers. In 1905 Brigadier General Adolphus W. Greely, Chief of Signal convinced Congress to increase the Signal Corps strength from 850 to 1258. The Act authorized 46 officers and 1,212 enlisted soldiers.<sup>19</sup>

General Greely tenaciously lobbied for resources to support all endeavors assigned the Signal Corps. The superior support and

attitude exhibited by Signal personnel led Major General James F. Bell, Army Chief of Staff, to state the following in his 1907 annual report.

" As one result of the last great war military men all over the world have come to recognize as and absolute essential to success in warfare the ability to keep the commander in-chief in reliable communications with every fraction of his command, which must in the future be much more widely scattered than heretofore.

" The duties of Signal Corps men have become so highly technical that it would not be practicable, after war was declared, to teach them their technical duties on the field of battle in such manner as to make them reliable and efficient in the discharge of their obligations.

" Therefore we should always maintain in peace a sufficiently large and highly trained Signal Corps to equip at least our first large Army put in the field."20

#### Signal Aviation Exploration

General Greely showed an interest in the science of heavier-than-air flight in 1898 by awarding Samuel Langley a contract to build a powered airplane. The project was not funded as planned due to the need to put the bulk of Signal resources in communications equipment and supplies at the outbreak of the Spanish-American War. Brigadier General James Allen, after one year in the Chief Signal Officer position, continued General Greely's aviation project and established an Aeronautical Division in August 1907. Specifications were developed for procurement of the first airplane, and in 1908 the Wright Brothers produced and flew the Army's first airplane. The Aeronautical Division became the Signal Corps Aviation Section and by 1916 had 175 officers involved in flying airplanes. The first airplanes were used for reconnaissance and communications, and piloted by such notables as

Captain Billy Mitchell and Lieutenant Henry H. Arnold. They were to become Generals in the Army Air Corps, and innovators in the application of aviation power to the battlefield.<sup>21</sup>

#### World War I

When the U.S. entered World War I in April of 1917 the role and responsibilities of the Signal Corps increased. Research and development in communications theory and its applications to battlefield requirements also increased. The Signal Officer corps was increased in brain power and technology power by the addition of scientists and engineers from industry and engineering educational institutions across America. These officers were given reserve commissions up to the grade of Major, the highest grade that the Army could legally bestow on them. Laboratories were established in the U.S. and France for research in radio and other signal. Captain Armstrong, a Signal Officer and member of the Paris Laboratory, developed the Superheterodyne radio receiver, a discovery that revolutionized the field of signal. This group of officers developed new communications equipment and techniques to fight trench warfare in the war zone. All new techniques and procedures were included in training programs at Signal Training Centers in the U.S. and France.<sup>22</sup>

The total Signal Corps, land and aviation components, grew to over 200,000 personnel during the War. Its land component consisted of 2,712 officers and 53,277 enlisted men at the War's end. This was an increase from 55 officers and 1570 enlisted men at the beginning of the war. Trench warfare had driven the increase because extensive wire communications networks were

required to fight the War. Army communications doctrine was wire communications heavy for its Axis communications system, and more people were required to install and maintain the system. The Signal Corps controlled all combat communications except for those in the field artillery. Telephone and telegraph were the primary means of communications in front line areas. Radio was a secondary means close to the front due to its inaudibility during artillery barrages.<sup>23</sup>

The Outpost Company of each Field Signal Battalion was increased from 75 to 280 men. A platoon from this organization with one Signal Officer and sixty-five enlisted signalmen was assigned to each Infantry Regiment. Each infantry regiment also had an organic signal platoon with one officer and seventy-six enlisted men. The officer commanding the platoon was an Infantry officer versus a Signal Corps officer. He was chosen by his commanding officer for the communications officer duties. The only training the officer received in signal was in his branch's basic officer course which did not make him technically experienced or qualified to lead the signal soldiers in his platoon. Most officers resented the additional duties of Signal Officer, since it precluded them from competing with peers for promotion to command. If the officer became too proficient in the job, his commander was reluctant to release him from his duties to compete for jobs in his branch.<sup>24</sup>

Signal soldiers with combat troops represented four percent of the total combat troop strength. They were known for their heroics and diligent work traits in keeping the communications



systems working to support leaders of front line troops. Their losses in casualties were second only to Infantry during the war. General Pershing in commending the Signal Corps wrote the following after the Armistice:

Each Army, Corps, and Division has had its full quota of field signal battalions, which, in spite of serious losses in battle, accomplished their work, and it is not too much to say that without their faithful and brilliant efforts and communications which they installed, operated, and maintained, the success of our Armies would not have been achieved."<sup>25</sup>

#### Post World War I

The War Department was reorganized in 1920 and reduced in size as a result of the post-war demobilization of the Army. The Signal Corps was also reorganized and reduced in size due to its reduced combat arms role. During the War the Signal Corps was responsible for communications in an Infantry Division down to the maneuver brigade/regimental level. This mission was handled by a Signal Battalion with a strength of 17 officers and 459 enlisted men. After the War a division was supported by a signal company of 7 officers and 168 enlisted men, and had Signal responsibilities only at Division headquarters. The maneuver arms branches became responsible for their own communications at Brigade level and below.<sup>26</sup> Major General Squier, the Chief Signal Officer in 1922, responded to these Signal Corps role and mission changes in his annual report with this statement:

" It is the belief of this office that the present system of dividing signaling duties, in units smaller than divisions, among the various branches of the service will not survive. The problems in connection with the procurement and training of personnel, standardization of methods, technical equipment, etc., will find no happy solution where they

are treated as auxiliary duties, as they ever must be among branches which have their own basic duties to consider first."<sup>27</sup>

## World War II

At the outbreak of World War II Signal Corps active component strength was less than 300 officers and 4,000 enlisted men. Congress continued to recognize the Signal Corps as an arm and a service by virtue of the 4 June 1920 War Department reorganization Act. However, War Department reorganization in 1942 changed the Signal Corps role to a technical service along with six other branches under the Army Service Forces.<sup>28</sup> Units at division and echelons above division had Signal Corps organizations to install, operate and maintain their communications systems and equipment. Army doctrine still had the units below division headquarters establishing their own communications systems. Commanders at regimental level and below designated an officer of the unit to perform the duties of communications officer. The communications officer's responsibilities included management of installation, operation and maintenance of command and control communications systems and equipment in his unit.<sup>29</sup>

When the war began a division had approximately one thousand pieces of communications-electronic equipment. By the War's end battlefield requirements stated by commanders at all echelons caused this number to rise to approximately one thousand four hundred pieces in a division.<sup>30</sup> The number of Signal Corps personnel authorized in front-line combat units was limited to ten

percent of a total Signal Corps strength that numbered 350,000 at the War's end.<sup>31</sup>

Unfortunately, Signal Officers at Division and Theater Army level were dual-hatted with responsibilities cutting across general and special staff lines of organization. They were also commanders of the respective Signal organizations at these echelons. The combination of their staff and command responsibilities functionally overextended them. They were unable to get out to visit and mentor regimental and maneuver battalion field organization communications officers, or offer assistance to their commanders.<sup>32</sup>

Communications officers at regimental and maneuver battalion level were from combat arms branches. Their knowledge of Signal matters was limited to training they received in their respective branch schools and what they learned on the job. Training was focused on the installation of field wire and telephone, message preparation, and operation of (VHF) single channel radio sets. Most resented having to work outside their basic branch. In many cases their resentment affected their performance, and the quality of communications support. The conscientious officer was often penalized for his diligence, because he spent what was considered an inordinate amount of time in signal and became labeled a commo officer. When this occurred he was considered to be less qualified to perform his branch duties and was not given comparable consideration for advancement. Their route to competing with peers for promotion to command positions was

virtually blocked. Branch transfer to Signal was their escape from the certainty of non-advancement in their branch of assignment.<sup>33</sup>

Commanders below Division level with responsibility for establishing their own communications systems, found themselves in a number of problems developed due to the lack of adherence to standard communications procedures and techniques. Each commander adapted his communications to whatever methods worked best in his regiment. Nonstandard use, or total lack of use, of Signal means in units was attributed to inexperienced and marginally trained communications officers whose commanders, of likewise skill, did not know how to manage and employ communications resources.<sup>34</sup>

The issue of Signal Officers in non-signal units below Division was raised on many occasions during the war. One incident in particular was the request of Brigadier General Henry L. P. King, China-Burma-India Theater Signal Officer, to put a signal unit in the 5307th Composite Unit, also known as *Galahad*, commanded by Brigadier Frank D. Merrill. The *Galahad* organization which became known as "Merrill's Marauders" was a regimental size Infantry unit designed for jungle warfare. It had a vast area of operation in the jungles of Burma and its primary means of communications to its headquarters in New Delhi was radio. The unit had many problems in radio communications operation and maintenance during its first months of existence. General King, after investigating the communications failures, found the cause to be threefold. The unit lacked adequately trained communicators. It also required a more reliable long range radio capability, because the hand cranked power supply for the portable

high frequency radio was cumbersome at best. The third item was it lacked the parts and radio repairmen to keep its equipment functioning. These deficiencies prompted his request to General Marshall for assignment of a signal organization to *Galahad*. The organization performing the communications function was a grouping of signal and infantrymen who were not familiar with high frequency radio operation, and lacked the maintenance knowledge and equipment to repair the unit's radios. Radio equipment failed constantly in the humid jungle environment. Opposition to General King's request was voiced by Colonel Francis Hill, a staff officer at General Stilwell's Theater headquarters, who kept a hard line for enforcing the War Department decision of 1920 to remove Signal Corps men from the front lines. What Colonel Hill failed to see was that jungle warfare circumstances under which the *Galahad* organization had to fight were different from circumstances on other battlefields. This situation would be repeated in the desert of Africa, the mountains of Europe, and the islands of the Pacific and other locations the Army found itself fighting in different theaters around the world.<sup>35</sup>

#### Post World War II

The end of World War II triggered a tremendous demobilization effort and reduction of U.S. military force structure. The War Department deemphasized pursuing planned research and studies in most new technology areas. This did not preclude the Signal Corps from conducting critical research by bouncing VHF signals off the moon and proving the feasibility of communications in space.<sup>36</sup> The Signal Corps structure was

reduced from a high of 350,000 personnel at the height of the war to 50,000 at the war's end. In comparison with the reductions taken by the Signal Corps at the end of previous wars, this figure was not as severe.<sup>37</sup>

#### Korean War

At the beginning of the Korean War U.S. forces were using World War II vintage equipment and doctrine to meet tactical communications requirements. This was Axis Communications System doctrine with mainstay telephone, telegraph and messenger as primary means, and single channel VHF Frequency Modulated (FM) radio as back up. Combat Arms officers were still performing as battalion and brigade communications officers. Korea's rugged terrain and lack of road networks required a quick change to VHF-FM radio as the primary means of communications. Signal Officers and signal soldiers learned to bend VHF-FM radio waves over mountains and bounced them off mountainsides and through valleys to get the message through. FM radio relay stations were installed by each Division Signal Company, and by Corps Signal Battalions on an area basis. The highest terrain available was used to achieve maximum range to support the fast moving Infantry. Some systems were capable of transmitting and receiving over 90 miles.<sup>38</sup> Many occasions were chronicled by Signalmen who were required to fight as Infantry in order to protect their isolated relay sites from destruction or capture by enemy forces.<sup>39</sup>

#### Post Korean War

Lessons learned in employing and using tactical communications in Korea revealed a need for more flexible and

mobile systems. The system chosen also had to be responsive on a nuclear battlefield. The first step was to identify a set of needs and concepts as initiatives for research and development to provide a reliable, light weight, mobile and flexible communications system. From these efforts a new doctrine evolved for establishing an Army Area Communications System for command and control. It featured a grid network on the battlefield providing a more flexible and survivable communications system for nuclear or conventional war.<sup>40</sup> The new doctrine also required reorganization of the Signal Corps and organizations performing signal missions, whether technical or operational. One significant change was the restructuring of Signal Support at Division level to meet the new Area System doctrine. The specific change was to replace the Signal Company at Division level with a Signal Battalion organization. Structure changes authorizing the Signal Battalion were made effective in 1963.<sup>41</sup> The Division Signal Battalion Commander retained his dual-hat role as commander of the Signal Battalion, and as a special staff officer on the Division staff.

In 1962, as part of an Army reorganization, the Chief Signal Officer on the Army Staff was redesignated as the Chief of Communications-Electronics. Redesignation of the position was required because the proliferation of communications-electronics in all battlefield functional areas required identification of a functional proponent to be responsible for policy, procedure and oversight of communications-electronics.<sup>42</sup>

## Transition Into The Space Age

After reorganization of the Signal Corps in 1962 a study of Signal functions throughout the Army was conducted by Department of the Army.<sup>42</sup> This was prompted by the growing complexity of communications-electronics functions and systems, and how communications-electronics technology had begun to effect the conduct of warfighting. By 1965 the communications-electronics equipment items in a Division level organization numbered over 4,000.<sup>44</sup>

The ability of a maneuver unit communications officer to plan communications support and coordinate the execution of all the available means of support became quite complex. A standard set of duties and responsibilities for the communications officer at the battalion and brigade levels had become hard to articulate. Technology was being introduced to the battlefield at an ever increasing pace. Therefore, the time had come to consider assigning a professional Signal Officer in all positions requiring a staff officer to perform signal functions.

Use of space satellite communications had begun, and opened up a new and dynamic area for exploitation to support warfighting. Hostilities erupted in the Southeast Asian country of Vietnam and again the United States heard and reacted to the call for help.

## Vietnam

At the beginning of U.S. involvement in Vietnam a professional signalman was required on maneuver unit staffs to sort out the ever increasing number of communications tasks. The



increase in tasks was attributed to the application of communications-electronics devices to more functions in maneuver units, as well as to functions throughout the Army. The void of expertise in Signal and in other technical and service support functional areas in the tactical Army prompted a series of Department of Army studies in 1965. The purpose of the studies was to determine the Technical Missions, Structure and Career Development (Project TECSTAR), and roles of Signal, Ordnance, and Quartermaster Corps respectively. The result of these studies was announced in a June 1966 message from General Harold K. Johnson, Army Chief of Staff. He directed that all communications officer positions in non-Signal Corps units throughout the Army be redesignated as Signal Corps positions.<sup>45</sup> Included in this announcement was the Army's definition of Communications-Electronics, described as follows:

Communications-electronics embraces design, development, installation, operations and maintenance of electronics and electrochemical systems associated with the collecting, transmitting, storing, processing, recording and displaying of data and information associated with all forms of military communications, excluding the responsibility for information and data systems and equipment which has been otherwise assigned.<sup>46</sup>

This definition helped to clarify the breadth and depth of the disciplines included, and the range of responsibilities associated with positions involving communications-electronic functions. These changes prompted corresponding changes in organization, personnel, and application of technological advancements and procedures to a number of functions.

### Clarification of Signal Mission

The term Communications-Electronics encompassed a variety of areas far beyond what had traditionally been designated as signal. The U.S. Army Signal Center, in January 1968, formed a Signal Center Team (SCT) at the direction of HQDA to identify and clarify problems and issues associated with communications-electronics.<sup>47</sup> Members of the team included the Commanding General, U.S. Army Signal Center as Chairman; CG U.S. Army Strategic Communications Command; CG, U.S. Army Electronics Command; U.S. Program-Project Manager, MALLARD; CG, U.S. Army Communications System Agency; and the Commandant, U.S. Army Southeastern Signal School.<sup>48</sup>

The specific missions of the SCT were to identify problems and conflicts, and to expedite and optimize solutions in areas of communications-electronics interest. The objectives of all efforts would be the strengthening of Army Communications-Electronics doctrine, training, and research and development.<sup>49</sup>

### Clarification of Signal Officer Roles

Also included in the tasks for resolution was the study of the future role of the Signal Officer within the various echelons of the Army's command structure from the maneuver battalion to theater level.<sup>50</sup> Most of the effort concentrated on duties and responsibilities of Signal Officers serving on the staffs at brigade and maneuver battalion levels, and the need for a signal staff element on the General staff at Division, Corps and Field Army.

At the time the team was formed, Division and Theater Army Signal unit commanders were dual-hatted and required to perform

the Signal planning, and coordination functions for their respective organizations. They also had the command and staff functions associated with their other hat as commander of a unit.

Proposals were made for formulation of a separate coordinating General Staff element for Communications-Electronics (G-6) on the same level as the other General Staff elements at Division through Theater level. This proposal was seen as consistent with policy that identified the office of the Assistant Chief of Staff for Communications-Electronics (ACSC-E) at Department of the Army, Post, Camps, Stations and Theater Army to provide single staff management of the broad functional area of Communications-Electronics. FM 101-5 Army staffing doctrine for TOE Army organizations stated that the single staff management for Communications-Electronics does not stop at the theater army but extends to all echelons below theater army.<sup>51</sup>

#### Proposed Staff Designation

Armed with this information the team began to formulate the argument for establishing Communications-Electronics General staff sections (G-6) at Division through Field Army levels, and relief from the dual-hat command and staff arrangements at Division and Theater level. One of the first actions was to compile a list of duties and responsibilities for the position of the ACofS, G-6, C-E. They were applicable to any Signal Officer serving at any level, although the scope of the activities of a Signal Officer serving at brigade and maneuver battalion level are of a lesser degree, but in no less degree of importance. An extract of these duties are as follows:<sup>52</sup>

## GENERAL

- Determine requirements, effectiveness, resources and capabilities of communications-electronics systems of the command.
- Prepare and coordinate plans for communications-electronics systems to meet command requirements.
- Develop and establish priorities and standards for integration of communications-electronics systems to meet command missions.
- Prepare C-E systems and annexes, SOI, SSI and routine combat orders.
- Coordinate with higher, adjacent, attached and supported units.
- Advise on technical aspects of communications-electronics.
- Advise on selection of command post locations, staging areas, administrative and logistics locations.
- Exercise operational control of assigned and attached signal units.
- Plan, coordinate and supervise radio frequency management.
- Determine requirements for Communications Security support.
- Validate requirements for communications-electronics systems, facilities and services.
- Determine signal personnel requirements in coordination with the G-1.
- Advise the staff on C-E support.

## COMMUNICATIONS

- Determine requirements for secure and non-secure communications support for the command.
- Plan and supervise the installation, operation, and maintenance of communications systems.
- Plan, coordinate and supervise the integration of C-E systems.
- Plan, coordinate and supervise C-E system in support of electronic warfare, combat surveillance, target acquisition, ASA operations, air defense, air traffic control, automated command and control, intelligence, administration and logistics, and switching.
- Develop and recommend the command's secure communications policy.

## FREQUENCY MANAGEMENT

- Plan, coordinate, supervise the utilization, engineering and assignment of radio frequencies.
- Resolve radio frequency interference problems.

### AUDIO-VISUAL

- Determine requirements, resources, capabilities and employment of audio-visual elements of the command.
- Plan, coordinate, and supervise all audio-visual activities and units of the command.
- Advise on the availability and suitability of audio-visual media and equipment for use in training, information, operation, and intelligence matters.

### ELECTRONIC WARFARE

- Assess the vulnerability of friendly and enemy communications-electronic systems to electromagnetic interference, and exploitation.
- Implement procedures to minimize vulnerability to enemy exploitation of the commands systems.
- Plan and supervise operations against enemy electronic systems.
- Provide technical advice and systems as required in support of electronic warfare.

### COMMUNICATIONS SECURITY

- Determine requirements for communications security (COMSEC) equipment and software.
- Prepare and promulgate command orders and instructions (C-EI, SOI, SSI).
- Plan and supervise integration of new COMSEC equipment.
- Prepare, promulgate and supervise implementation of the command COMSEC plan.
- Assist in inspection of units and communications facilities.
- Evaluate the impact of COMSEC compromise on combat operations.

This study, and the improved communications-electronics technology applications in all battlefield functional areas during the Vietnam War, demonstrated the need for professional communicators to be responsible for communications from strategic to maneuver battalion level. The duties and responsibilities of the communications-electronics staff officer (CESO) at brigade and

maneuver battalion level had become so numerous it was now impossible to put them in the hands of a part-time Signal Officer. Technology in the new equipment had added a degree of sophistication that required an understanding of signal theories that were only taught in Colleges or in the Signal Corps schools. By the late 1960s there were several thousand pieces of electronic equipment in the division and over 75,000 emitters in the field Army.<sup>53</sup>

Improvisation with communications equipment, as usual, became the means to insure effective command and control was provided to commanders. The terrain, as in the Korean War, was a dominate factor, and required greater reliance on VHF-FM radio for command and control at the tactical echelon. Use of aircraft, mainly helicopters, for transportation of troops on the battlefield and as command and control platforms also came into vogue. Innovative Signal Officers developed FM command and control consoles and retransmission packages for mounting in helicopters. The Electronics Command developed a fixed wing aircraft retransmission package. This allowed instant extension of command and control and provided commanders the ability to redirect resources and actions on the battlefield from a key vantage point. Division level communications were also enhanced by utilizing twelve-channel VHF radio systems to link key command and control centers together. Riverine operations conducted by the 9th Infantry Division, relied heavily on a brigade size flotilla and its ship-mounted multichannel VHF system, on the flagship *USS Benewah*. Another innovative packaging of

multichannel VHF was a three-quarter ton trailer mounted airmobile package of the 25th Infantry Division. Radio-wire integration utilizing VHF-FM radio also became a much used system throughout Vietnam.<sup>54</sup>

Some communications officers at the maneuver battalion and brigade level were serving as Headquarters and Headquarters Company Commanders and CESO. With the degree of sophistication just described evolving in communications-electronics, dual-hatted CESOs had no chance to be effective trying to do two jobs. It was for these reasons that, in 1968, brigade and battalion TOE authorization documents were changed to reflect communication officer positions in non-signal organizations, would be filled by Signal Corps officers.<sup>55</sup> Not since World War I had Signal Officers, wearing crossed flags, been authorized as communications officers in TOEs of non-signal units.

The significance of this change became evident as tactical Signal Officers, trained in all aspects of communications-electronics, began to fill the ranks in non-signal organizations. There were significant differences in the level of technical knowledge of Signal Corps branch-trained officers and officers that had transferred from other branches into the Signal Corps. The latter were predominantly officers who had been serving as communications officers in combat units at the start of the U.S. Army's involvement in Vietnam. They were extremely knowledgeable in tactical communications and operations at the maneuver battalion level. However, they lacked the "big picture" view of the total communications system at echelons above their own.

Officers who had received Signal training in the Signal Officer Basic and/or Advanced Courses were also more confident in the technical aspects of their duties than the officers who had not received training at the Signal Officer training centers. However, they lacked tactical operations expertise, a critical task of maneuver unit communications officers who were expected to perform as duty officers in the battalion operations centers. This was brought to the attention of the Signal Training Centers and the programs of instruction were changed to reflect more tactical operations training.<sup>56</sup> Signal Center trained officers also had a better understanding of the hierarchy of communications systems networks, and integration of communications above the tactical echelon. This was a key point as it was hard to discern where each echelon-division, corps, field army-communications responsibility boundry began and ended. The battlefield was a dynamic and fluid environment as far as unit responsibility for areas on a day to day basis. Differences were also evident in the maintenance of equipment, and reporting of maintenance and supply actions related to inoperable items of equipment. The diversity and number of pieces of communications-electronics equipment, that were being applied to functions for the first time on the Vietnam battlefield, went well beyond the training of a part-time Communications Officer in maneuver units. The following is a list of equipment or systems for which a non-signal unit Communications Officer could find himself responsible for supervising the installation, operation and maintenance.



- Communications components in combat vehicle crewman helmets.
- Night vision sights.
- Mine detectors.
- Searchlights
- VHF-FM single-channel radio.
- Vehicle intercommunications systems in tanks and armored personnel carriers.
- Amplitude Modulated Single-Side-Band (AM-SSB) radio.
- Ground surveillance radar.
- Telephone and switchboard equipment.
- Teletypewriter systems.
- Radioteletypewriter systems.
- Cryptographic equipment.
- Area Surveillance Radar.
- Field Artillery Fire Direction Computer (FADAC).
- Psychological Warfare Power Amplifier Systems.
- Special power generation systems, e.g. 400HZ generators.
- External power supplies for powering dismounted communications equipment.

Signal Officers trained at the Signal Training Centers had a better understanding of how C-E systems functioned, and the maintenance required to keep them functioning. They were also more apt to provide advice to their commanders on employment of all communications-electronics equipment, such as the area night vision starlight scope AN/TVS-4, and Radio Teletypewriter Set AN/GRC-142. Officers who had not been trained at Signal Training Centers were more prone to cannibalize equipment and delay the restoration of cannibalized equipment. These inactions kept critical equipment out of operation required in command and control, and degraded the unit's ability to see the enemy at night. These officers were also less prone to recommend utilization of newly fielded equipment, due to lack of knowledge of how it should be employed, or inability to understand the technical aspects of the equipment. Signal Officers in most cases had at least received training or an overview on new C-E items

being fielded. The amount of initiative taken by a Communications Officer to provide his commander with the critical support he required was directly proportional to the degree of technical knowledge of the C-E officer.<sup>57</sup>

Other key areas that trained Signal Officers showed a greater understanding in, than did their non-signal corps trained counterparts, were cryptography, and use of operations codes. Signal Officers were more familiar with cryptography and communications security, by virtue of more intensive training on the subject at Signal Training Centers. Voice encryption over VRC-12 series FM radio became a reality in 1965 with the issuing of KY-8 code-name (NESTOR) encryption equipment. Commanders were reluctant to use it because of a number of reasons. First, when operating in the secure mode the operating range was reduced because radio frequency power output was reduced. Second, initially there was no way of retransmitting the signal to increase the range; which was possible over VRC-12 series in clear transmission mode. Finally, the KY-8 failed to function reliably in heat. These problems were overcome with the adaptation of the smaller, more reliable manpack version, KY-38 NESTOR equipment, to use with vehicular radios and addition of a retransmission capability with the development of the HYL-3 Regenerative Repeater.<sup>58</sup>

The reality of the vulnerabilities involved in operating FM radio in the clear mode was made known with the capture of an enemy Signal Intelligence organization in December 1969. The detachment used U.S. AN/PRC-25/77s radios, Chinese military radio

equipment, and some commercial radio sets. Captured intercept logs revealed that the enemy's collection methods were sophisticated, and that they knew a great deal more about our operations than we had given them credit for knowing.<sup>59</sup> This led General Creighton Abrams, Military Assistance Command Vietnam Commander, to state:

"This work is really rather startling; the attention to detail, complete accuracy, and thorough professionalism is amazing. These guys are reading our mail, and everyone will be informed that they are."<sup>60</sup>

The use of field expedient communications means, especially radio wave propagation expedients, although taught at non-signal Training Centers, were better understood by Signal Corps trained officers. This was due to more in-depth theory instruction in radio and radio wave propagation provided by Signal Corps Training Centers and Schools. Many argued the issue that a better quality Signal Officer only came from Signal Training Centers. This argument was not without its exceptions as some of the officers who transferred to Signal from the combat arms branches were outstanding C-E technicians, staff officers, and seldom paralleled leaders.

As more Signal Corps trained officers rotated into Vietnam and filled non-signal unit communications officer positions, the quality and maintenance of communications-electronics resources available to commanders were greatly improved.<sup>61</sup> Major General Thomas M. Rienzi in his Vietnam Studies writings stated the following in support of Signal Officers serving at all echelons in non-signal units:

"It was proved to all the division commanders, corps commanders, and theater commanders that it was a necessity to have a professionally trained Signal Corps officer assigned to each battalion, group, and brigade of the Army's combat arms. It was necessary in order to create a vertical chain of communications officers from the bottom to the top--officers whose professional training and interests had dedicated them to the accomplishment of the communications-electronics mission. Each of these officers was able to translate his commander's needs into actual working communications. Through these officers, the commander was made aware of the capabilities, the limitations, and the peculiarities of his own communications system.<sup>62</sup>

The Army Area Communications System had received a rigorous test in Vietnam and passed the test with some glaring problems. Resolution to a number of problems were already in research and development, and some fixes were already in procurement. We began to replace the unreliable and nonsecure multichannel VHF radio and frequency division multiplex (FDM) equipment, with secure Pulse Code Modulation (PCM) multiplex, and smaller more reliable carrier radio sets at Division, Corps, and Field Army echelons.

The most significant Signal event that occurred during the Vietnam War was the assignment of Signal Officers to fill communications officer spaces at brigade and maneuver battalion level. Its lasting effects on the development of command and control systems at all levels of war was yet to be realized when the Vietnam War ended.

#### NEW ROLES OF SIGNAL SUPPORT

One role of the Signal Officer that received very little attention during all previous wars was joint communications requirements and coordination. Joint communications were normally accomplished between Service components by physically

locating liaison communications personnel and equipment teams with sister services. There was little standardization in theater-tactical means of communications employed by the services. This meant that each service component required more communications systems than it really needed. These duplications were required to meet operational coordination requirements with sister services, and to overcome service induced communications incompatibility and interoperability problems. The services were also lacking a program for training communications-electronics personnel for joint operations jobs. The Army gave lip service to the need to become more joint oriented as did the Navy, the Air Force and the Marine Corps. The Army sent Signal Officers in the grade of Major and Captain to the Information Systems Staff Officer Course at Keesler Air Force Base, Mississippi, mainly to take advantage of the fixed station Defense Telecommunications System management focus of the course. However, there was an unexpected introspection that each officer received having attended the course. It was an increased understanding of the way each of the sister services performs its communications business at all echelons.

Most Signal Officers serving in Army networking, switching, frequency management, planning, engineering and integration roles, were highly proficient at preparing communications plans in support of Army operations and missions. However, their ability to coordinate joint communications operational requirements and solve interoperability issues for communications security, CEOIs, and systems integration, was lacking. These deficiencies were

never more evident than during joint operation Urgent Fury, conducted on the island nation of Grenada in 1983. This operation painfully pointed out to the Army, other services, and the Joint Staff, that Army communications officers at all levels must be included in, and given the opportunity to work and resolve joint communications issues, and not confine themselves only to the needs of their own Service.

After Grenada, Army Signal planners were included in planning and coordination for joint operations involving the Army. Training for Signal planning and operations personnel serving throughout the military establishment is provided through a number of means. One notable course with a joint focus is the Joint Command, Control, and Communications Staff and Operations Course established by the Deputy Secretary of Defense in 1978. The Course is conducted by the Armed Forces Staff College of the National Defense University under the Joint Staff. Quotas for the course are allocated to the unified and specified commands, the Services, and DOD agencies by the Joint Staff.<sup>63</sup> More emphasis was placed on joint C<sup>3</sup> planning and training for all joint exercises. More joint exercises were planned and conducted with command, control and communications being stressed. Operation Golden Pheasant, conducted in Honduras in 1988, was very successful due to the well coordinated and executed communications plans. The mission to improve interoperability, standardization of procedures, compatibility, and integration of equipment and systems was given to the Joint Tactical Command, Control, and Communications Agency (JTC<sup>3</sup>A) in 1984. This agency has

responsibility for identifying interservice and allies C3I problems for resolution.<sup>64</sup>

The true test of how well joint training and planning was developing, was demonstrated in Operation Just Cause in Panama, December 1989. The JTF Commander, LTG Carl Stiner, knew the importance of communications and did not want a repeat of Grenada. To that end, he involved a signal planner in every phase of planning for Operation Just Cause.<sup>65</sup> This operation was one of the best planned and executed joint communications endeavors ever. The planners developed and promulgated a joint CEOI which was agreed to by all services and approved by the JTF Commander. The end result of the planning was the successful execution of communications being provided to the JTF Commander, and Commander of the 82d Airborne Division, while airborne, from the point of embarkation, at Fort Bragg, to the Drop Zone in Panama. Both Commanders, while airborne and enroute, could monitor the order of airborne sorties loading and taking off, and re-sequence deploying forces and sorties for employment based on the changing situation in the target area in Panama.

However, the communications success in Panama was not without its problems. Early planning did not take into account the need for a systems control center to effectively manage frequencies, networks, and switching of all deployed signal elements. This was accomplished with the later deployment of the 35th Signal Brigade System Control Center (SYSCON), which for all intended purposes became a theater communications control element. This identified the need to include provisions for a theater

communications management control capability that can manage, control, integrate and coordinate all of the communications resources and support requirements in theater. This was still a subject of study when Operation Desert Shield began in Saudi Arabia in August 1990.<sup>66</sup>

Exercise Desert Shield, which evolved into Operation Desert Storm on 16 January 1991, now ranks as the most complex communications operation ever conducted and clearly points out the need for competent, professional communicators at all echelons.

It has become known as a stand-off war fought with Nintendo weapons. Advancements made in information handling technology, have been utilized in all weapon systems deployed and employed in the Desert Storm theater of operation. Command and control in the fog of battle is more critical now than ever before, since the weapons of war are more lethal, and can be delivered quickly by a number of means. The unit Signal Officer in non-signal units is the catalyst for synthesizing command and control communications systems. The need to understand, integrate and synchronize communications means is vital for the commander to have effective command and control to fight, sustain and win the airland battle. The modern battlefield today has gone from command and control using wire, messenger, and radio to using a number of redundant systems in support of each battlefield functional area including maneuver, fire support, air defense, intelligence and electronic warfare, and combat service support. These systems, of necessity, encompass all services on a joint battlefield.



The Signal Officer of today must understand host nation, strategic, theater and tactical communications, how they are all tied together, and what the requirements are for his service and the other component services. He must concern himself with integrating systems that are becoming more automated and a mix of analog and digital modes. Coordination and planning for integrating communications networks supporting systems, for intelligence, position navigation, maneuver control, data distribution, automation, satellite, fire support and air defense is no easy task. To detail this role and responsibility to non-signal personnel will start the degeneration of advances made in the communications piece of the C<sup>3</sup> equation. The end product sought is support to a commander's mission. The edge in C<sup>3</sup> the Army has over any of its adversaries stems from contributions made in communications and communications support over the past twenty years by professional Signal Officers and soldiers.

#### FUTURE SIGNAL FORCE REQUIREMENTS

As force structure planners begin to look at peacetime force requirements it is imperative that each space be considered by its value added to the whole force. Signal Corps history chronicles the detrimental effects each reduction of the branch had on command and control. The Army is faced again with hard decisions in structure cuts and where to take those cuts. One of the questions asked will be whether to retain Signal Officers in non-signal units, and if so, for how long, and down to what level should they be retained?

Some of our leaders feel that Signal Officer positions at brigade level and below should not be retained in order to trade off for medical and combat arms spaces. Before this option is considered the following question also requires answering. Is this a move that would eventually spell disaster for a smaller Army? A no-notice contingency deployment, requires the deployed force Signal Officer on the ground to effect coordination with other services, assign and resolve frequency problems, integrate and advise his commander on all communications means available, and coordinate interface with available host nation systems. The number of information handling and communications means available to a commander to pass information is also increasing. As the Army is reduced in size it will place more emphasis on increasing weapon lethality, speed of deployment, employment and sustainment of personnel and weapon systems. It will also rely more heavily than ever on timely command and control to fight in the highly technical battlefield environments expected to confront its soldiers in the future. The individual being trained to integrate command and control systems and provide technical advice to the commander and his staff is the Signal Officer. These tasks require a Signal Officer with the technical knowledge gained through Signal training and experience in working at different levels of Signal Support.

Other viewpoints cite a definite need to retain Signal Officers in non-signal units, even if it means taking signal platoon leaders out of signal battalions. This is the typical "rob Peter to pay Paul" approach and would compound an already

exacerbated problem of officer shortages in the Signal Corps. The Division and Corps Signal Officers have historically not had enough Signal Officers in the grades of captain and major, and filled non-signal unit staff positions by upward substitution of lieutenants. This is not the place to grow Signal Corps lieutenants or any lieutenant. Officers identified to fill non-signal unit signal positions must first be assigned for one year to a Division or Corps level Signal Battalion to gain experience in networking at Division or Corps. This view is based on the requirement to know the ingredients of a Theater Area Communications System and understand how to integrate its parts into a network that functions from tactical to strategic echelons.

On the non-linear battlefield envisioned in Airland Battle-Future doctrine, signal support will require the Signal Officer to understand all pieces of the communications and information systems supporting battlefield functional areas. He must then have the confidence to advise his commander on prioritizing the use of communications to access critical decision making information. The Army's new Mobile Subscriber Equipment (MSE) set a precedent by providing mobile telephone service down to maneuver battalion level. Common user command and control system access in the MSE predecessor system was only to brigade level. Maneuver unit commanders will soon have a number of battlefield automated systems to aid in decision support in all battlefield functional mission areas. Commanders deserve a seasoned Signal Officer to provide the assistance and advice required to integrate and use these critical systems.

Another opinion offered supports adding more authorizations for Signal Officers to the force structure. This is predicated on the application of new technology in tactical and strategic C3I functional areas requiring Signal Officers for management, and the need for an active duty Theater Communications Command-Army (TCC-A) contingency organization. The primary functions of a TCC-A are network/frequency management, key variable management, communications integration and network interoperability. Operation Desert Storm has confirmed that the latter requirement exists, especially for the size force the U.S. deployed and its subsequent integration into a large multi-national coalition organization. The initiative to establish a TCC-A for Operation Desert Storm was begun in mid-December 1990, approximately four months into Exercise Desert Shield. It is too early to tell how successful the composite TCC-A organization has been or will be. The organization assigned the TCC-A mission for the Army Component of U.S. Central Command is in the Reserve Component. This requires close scrutiny and possibly a change to reflect a mix of active and reserve components as a result of Operation Desert Storm.

The absence of a TCC-A organization at the beginning of Operation Desert Storm became significant when additional U. S. Army and Allied forces were deployed to the Theater of Operations. Without the TCC-A, each major element was required to perform the following TCC-A functions.

- Frequency acquisition.

- Resolve problems with assignment/reassignment of frequencies for units that continuously changed location and passed through adjacent unit boundaries.
- Coordinate host nation support requirements.
- Plan and develop joint and combined CEOIs.
- Provide COMSEC and key variable management for its units throughout the theater.

Initial observations and lessons learned from Operation Desert Shield/Desert Storm, highlight the necessity to retain Signal Officers in non-signal units. Problems have been encountered in many areas. Some are certainly due to the large scale no-notice deployments. These problems ranged from units not deploying with required communications security assets, to instances of frequency management and interference, and subscribers lacking knowledge of how to use available communications means. Other problems involved integration and interoperability issues, and disconnects on responsibility for installation of internal wire and phones at command posts.<sup>67</sup> Most of these problems were resolved by the Signal Officers on site. It is easy to see that resolutions of these type problems would be delayed if Signal Officers were not assigned in non-signal units, and would impair the ability of the commander to command and control his forces.

Postulating the future role of the Signal Officer, it is evident that Signal Officers must be retained in maneuver units for now and sometime in the future. Application of new and developing technology may eventually reduce the need for Signal

Officers in some Division and Corps non-signal units. This will come as the result of increased institutional knowledge of the Information Mission Area/Signal Support disciplines and the systems supporting them. These disciplines are printing and publications, communications, automation, records management, and visual information. However, employment of technology in these disciplines and learning to use it effectively will most likely not occur for ten to fifteen years out. There will always be a requirement to retain a corps of signal units and officers at all echelons from strategic through tactical to provide systems control and expertise. Command and control systems equipment in non-signal units will be smaller, user owned and operated, and user maintained as FM radios and personal computers are in units today.

#### CONCLUSION

We must not lose sight of how we have gotten to where we are in command, control, and communications. Signal Officers have been involved in the process since the Civil War. Through their analysis of the communications support required to give their battlefield commanders the edge in battle have come innovations such as Morse telegraph in the Civil War; submarine cable in the Spanish-American War; Air to Ground radio in WWI; the Frequency Modulated "handie and walkie-talkies" and vehicular radios in WWII; innovative use of VHF-FM radio in Korea; the VRC-12 series FM radios, and adaptation of VHF multi-channel in Vietnam; satellite communications in Vietnam; and today's boom in information technology systems adapted to all battlefield

functional mission areas. Communications systems, such as Mobile Subscriber Equipment, SINCGARS and the Army Data Distribution System will carry critical information to aid combatant commanders in making timely decisions to win battles today and into the twenty-first century.

Future concepts envision a wireless digital distributed local area network that will interface through gateways to the current area, data, and combat net radio systems located throughout the corps area.<sup>68</sup> This vision of battlefield communications and information systems employment supports future warfighting doctrine.

Airland battle-future is our emerging doctrine and the innovators of the Signal Corps have taken steps to meet the non-linear battlefield envisioned in that doctrinal concept. To insure that a vital element of that doctrine, command and control, is fully supported the Signal Officer must be kept in the combat maneuver units, "where the rubber meets the road." His purpose in being there is to provide advice to the commander on how best to employ his communications and information systems, to effect timely and reliable transfer of critical information. The Signal Officer is also charged, as he has been since Civil War time, with analyzing problems and developing solutions to improve the reliability and speed of getting the message through; to provide the essential means of command and control for the highly mobile and lethal forces of the future. To deny Signal Corps officer presence in the combat environment would again create a operational void and seriously degrade the U.S. Army's ability to

bring maximum combat power to bear, at the right time and the right place.



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56. Myer, p. 95.
57. Both authors served in Vietnam. Col. Buck served as the Communications-Electronics Maintenance Officer in the Division Material Office of the 25th Infantry Division. While in this capacity he was able to observe all unit Signal Officers in the Division, and the operations of the 125th Signal Battalion.
58. The 25th Infantry Division had an excellent field maintenance program designed to fix equipment as far forward as possible. On a number of occasions Col. Buck, then 1Lt. Buck, traveled with the Assistant Division Commander, DISCOM Commander, or with unit Signal Officers to different locations on the battlefield with a team of C-E repairmen to fix items on the spot. He also made visits to units on operations to get an idea of their maintenance support requirements. Through these visits the skill and knowledge of communications-electronics staff officers of the Division were observed and noted.
59. LTG Charles R. Myer, Division Level Communications 1962-1973, 1982, pp.65-72.
60. Ibid. p. 67.
61. Lt. Buck left Vietnam in July 1970 at the completion of his tour. During his year in Vietnam most of the officers filling communications officers positions in combat maneuver units had rotated out and their replacements were well into their tours of

duty. All replacement officers were Signal Officers out of the Signal Corps training system. The level of maintenance in the 25th Division had improved to such a degree that on the day Lt. Buck left Vietnam the Division had only 89 pieces of Communications-Electronics equipment deadlined for maintenance. The communications in maneuver units and throughout the Division, by Lt. Buck's observations, was at its best level ever.

62. Thomas M. Rienzi, Communications-Electronics 1962-1970, p. 166.

63. U.S. Department of The Navy, Armed Forces Staff College Publication 10.22, p. 4.

64. Archibald and Michelli, "JTCJA," Signal, November 1984.

65. LTC Dale was a battalion commander and subsequently the Executive Officer of the 35th Signal Brigade which supports the 18th Airborne Corps. He coordinated preparation of 35th Signal Brigade plans supporting Operations Golden Pheasant and Just Cause.

66. Ibid. LTC Dale coordinated the preparation of 35th Signal Brigade changes to plans supporting the 18th Airborne Corps based on lessons learned from Operations Golden Pheasant and Just Cause.

67. U.S. Army Center For Lessons Learned, "Desert Shield Communications Observations," 5 February 1991, p. unnumbered.

68. Clarence A. Robinson, Jr., "Army's Digital Devices Move Presses Tactical Automation," Signal, November 1990, p. 27.

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